CLAIMS

1. Ranging system for determining ranging information of a transponder in a communication channel, especially of a satellite, comprising:

a first receiving arrangement (7) for receiving a first payload signal suitable for being transmitted to said transponder and for generating a first output signal;

a second receiving arrangement (7') for receiving a second payload signal transmitted from said transponder and for generating a second output signal, wherein the second payload signal is delayed due to traveling through the communication channel;

means for tracing a predetermined signal pattern in said first and said second output signal; and

means for determining the delay between the first and second output signals on the basis of said tracing of the signal pattern.

2. Ranging system according claim 1, wherein said first receiving arrangement (7) comprises a first tuner (71), a first demodulator (72) and a first decoder (73), said first output signal generated by said first receiving arrangement (7) being a decoded digital signal, and wherein said second receiving arrangement (7') comprises a second tuner (71'), a second demodulator (72') and a second decoder (73'), said second output signal

generated by said second receiving arrangement (7') being a decoded digital signal.

3. Ranging system according to claim 2, wherein said processing means comprise a first processor (8) for receiving said first decoded digital output signal and for outputting a first trigger signal (START, EMISSION) and a second processor (8') for receiving said second decoded digital output signal and for outputting a second trigger signal (STOP, RECEPTION).

4. Ranging system according to claim 3 wherein said processing means further comprises a time measurement circuit (9) for receiving said first trigger signal (START) and said second trigger signal (STOP) from said first and second processors (8, 8') and for measuring the time between said first and said second trigger signal (START, STOP).

5. Ranging system according to claim 3 wherein said processing means further comprises a clock circuit (11) for providing time information to said first and second processors (8, 8') and/or to said time measurement circuit (9).

6. Ranging system according to claim 2, wherein said first and second receiving arrangements (7, 7') are connected to a satellite antenna (5) for transmitting a signal to said satellite and for receiving a signal from said satellite.

7. Ranging system according to claim 6, wherein said first and second receiving arrangements (7, 7'), said first and second processors (8, 8'), said time measurement

circuit (9) and said clock circuit (11) are provided at a ground station (1) further comprising a multiplexer/encoder (2) receiving a plurality of digital payload signals (6-1 ... 6-n) and generating a digital transport stream signal (DVB), a modulator for modulating said digital transport stream signal (DVB), such modulated digital transport stream signal being supplied to said first decoding arrangement (7), an upconverter (4) for converting said digital transport stream signal (DVB) into a signal suitable for being supplied to said satellite antenna (5) and a downconverter (10) for receiving a signal from said satellite antenna (5) and for supplying a modulated digital transport stream signal to said second decoding arrangement (7').

8. Ranging system according to claim 3, wherein said processing means further comprises a first time measurement circuit (9) for receiving said first trigger signal (EMISSION) from said first processor (8) and time information from a first clock circuit (11) and a second time measurement circuit (9') for receiving said second trigger signal (RECEPTION) from said second processor (8') and time information from a second clock circuit (11'), wherein said second time measurement circuit (9') transmits the received time information to said first time measurement circuit (9) for measuring the time between said first and said second trigger signal (EMISSION, RECEPTION).

9. Ranging system according to claim 8, wherein said first receiving arrangement (7) is connected to a first satellite antenna (5) for transmitting a signal to said satellite and wherein said second receiving arrangement

(7') is connected to a second satellite antenna (13) for receiving a signal from said satellite.

10. Ranging system according to claim 9, wherein said first receiving arrangement (7), said first processor (8), said first time measurement circuit (9) and said first clock circuit (11) are provided at a first ground station (1) further comprising a multiplexer/encoder (2) receiving a plurality of digital payload signals (6-1 ... 6-n) and generating a digital transport stream signal (DVB), a modulator for modulating said digital transport stream signal (DVB), such modulated digital transport stream signal being supplied to said first decoding arrangement (7), and an upconverter (4) for converting said modulated digital transport stream signal (DVB) into a signal suitable for being supplied to said first satellite antenna (5).

11. Ranging system according to claim 9, wherein said second receiving arrangement (7'), said second processor (8'), said second time measurement circuit (9') and said second clock circuit (11') are provided at a second ground station (12) further comprising a downconverter (10') for receiving a signal from said second satellite antenna (13) and for supplying a modulated digital transport stream signal to said second decoding arrangement (7').

12. Ranging system according claim 1, wherein said first receiving arrangement (7) comprises a first tuner (700), said first output signal generated by said first tuner (700) being an analogue signal, and wherein said second receiving arrangement (7') comprises a second tuner

(700'), said second output signal generated by said second tuner (700') being an analogue signal.

13. Ranging system according to claim 12, wherein said processing means comprises a first processor (8) for receiving said first analogue output signal, for sampling said first analogue output signal to obtain a first series of sampled values and for outputting a first trigger signal (START, EMISSION) and a second processor (8') for receiving said second analogue output signal, for sampling said second analogue output signal to obtain a second series of sampled values and for outputting a second trigger signal (STOP, RECEPTION).

14. Ranging system according to claim 13, wherein said processing means further comprises a time measurement circuit (9) for receiving said first trigger signal (START) and said second trigger signal (STOP) from said first and second processors (8, 8') and for measuring the time between said first and said second trigger signal (START, STOP).

15. Ranging system according to claim 13 , wherein said processing means further comprises a clock circuit (11) for providing time information to said first and second processors (8, 8') and/or to said time measurement circuit (9).

16. Ranging system according to claim 12 , wherein said first and second receiving arrangements (7, 7') are connected to a satellite antenna (5) for transmitting a signal to said satellite and for receiving a signal from said satellite.

17. Ranging system according to claim 16, wherein said first and second receiving arrangements (7, 7'), said first and second processors (8, 8'), said time measurement circuit (9) and said clock circuit (11) are provided at a ground station (1) further comprising a multiplexer/encoder (2) receiving a plurality of digital payload signals (6-1 ... 6-n) and generating a digital transport stream signal (DVB), a modulator for modulating said digital transport stream signal (DVB), such modulated digital transport stream signal being supplied to said first decoding arrangement (7), an upconverter (4) for converting said digital transport stream signal (DVB) into a signal suitable for being supplied to said satellite antenna (5) and a downconverter (10) for receiving a signal from said satellite antenna (5) and for supplying a modulated digital transport stream signal to said second decoding arrangement (7').

18. Ranging system according to claim 13, wherein said processing means further comprises a first time measurement circuit (9) for receiving said first trigger signal (EMISSION) from said first processor (8) and time information from a first clock circuit (11) and a second time measurement circuit (9') for receiving said second trigger signal (RECEPTION) from said second processor (8') and time information from a second clock circuit (11'), wherein said second time measurement circuit (9') transmits the received time information to said first time measurement circuit (9) for measuring the time between said first and said second trigger signal (EMISSION, RECEPTION).

19. Ranging system according to claim 18, wherein said first receiving arrangement (7) is connected to a first satellite antenna (5) for transmitting a signal to said satellite and wherein said second receiving arrangement (7') is connected to a second satellite antenna (13) for receiving a signal from said satellite.

20. Ranging system according to claim 19, wherein said first receiving arrangement (7), said first processor (8), said first time measurement circuit (9) and said first clock circuit (11) are provided at a first ground station (1) further comprising a multiplexer/encoder (2) receiving a plurality of digital payload signals (6-1 ... 6-n) and generating a digital transport stream signal (DVB), a modulator for modulating said digital transport stream signal (DVB), such modulated digital transport stream signal being supplied to said first decoding arrangement (7), and an upconverter (4) for converting said modulated digital transport stream signal (DVB) into a signal suitable for being supplied to said first satellite antenna (5).

21. Ranging system according to claim 19 , wherein said second receiving arrangement (7'), said second processor (8'), said second time measurement circuit (9') and said second clock circuit (11') are provided at a second ground station (12) further comprising a downconverter (10') for receiving a signal from said second satellite antenna (13) and for supplying a modulated digital transport stream signal to said second decoding arrangement (7').

22. Method for determining ranging information of a transponder in a communication channel, especially of a satellite, comprising:

receiving a first payload signal suitable for being transmitted to said transponder and for generating a first output signal;

receiving a second payload signal independently from said first payload signal for generating a second output signal, wherein the second payload signal is delayed due to traveling through the communication channel;

means for tracing a predetermined signal pattern in said first and said second output signal; and

means for determining the delay between the first and second output signals on the basis of said tracing of the signal pattern.

23. Method according to claim 22, further comprising the steps of starting a time measurement on the basis of the first trigger signal and stopping the time measurement on the basis of the second trigger signal.

24. Method according to claim 22 , further comprising the step of obtaining time stamp information and processing the delay together with the time stamp information.

25. Method according to claim 22, further comprising the steps of: obtaining first time stamp information upon detection of the predetermined bit sequence or group of bit sequences in the first output signal; obtaining

second time stamp information upon detection of the predetermined bit sequence or group of bit sequences in the second output signal; and determining the delay on the basis of the first and second trigger signals and the first and second time stamp information.

26. Method according to claim 22, further comprising the step of synchronizing clock circuits providing the time stamp information.

27. Method according to claim 22, wherein the first and second output signals are regenerated digital transport streams, for example according to the MPEG-2 and/or DVB standards, and obtaining a first received analogue signal.

28. Apparatus for calculating the signal delay of a payload signal traveled through a communication channel, comprising:

first receiving means for receiving a first time stamp information from a first processing means (8), by which the first time stamp information was traced out of a first payload signal suitable for being transmitted through said communication channel;

second receiving means for receiving a second time stamp information from a second processing means (8'), by which the second time stamp information was traced out of a second payload signal, wherein the second payload signal is delayed due to traveling through the communication channel; and

calculating means for calculating the signal delay on the basis of the first time stamp information and the second time stamp information.

29. Method for calculating the signal delay of a payload signal traveled through a communication channel, comprising:

receiving a first time stamp information from a first processing means (8), by which the first time stamp information was traced out of the first payload signal suitable for being transmitted through said communication channel;

receiving a second time stamp information from a second processing means (8'), by which the second time stamp information was traced out of the second payload signal, wherein the second payload signal is delayed due to traveling through the communication channel; and

calculating means for calculating the signal delay on the basis of the first time stamp information and the second time stamp information.

30. Ranging system for measuring the relative velocity of a transponder in a communication channel, especially between a ground station and a satellite, on the basis of first and second payload signals including counter values (CNT), which are generated by a first digital counting means (102) driven by a reference timing means (101) at a first frequency, transmitted by said transmitter, comprising:

first receiving arrangement (107, 108, 109) for receiving said first payload signal suitable for being transmitted to said transponder,

second receiving arrangement (107', 108', 109') for receiving said second payload signal, wherein the second payload signal is delayed due to traveling through the communication channel,

wherein said first receiving arrangement (107, 108, 109) and said second receiving arrangement (107', 108', 109') comprise

- receiving means (107, 107') for demodulating said first or second payload signal respectively,

- extracting means (108, 108') for extracting the counter values (CNT) from the first or second payload signal respectively, and

- second digital counting means (109, 109') for generating second counter values at a second frequency,

and wherein said second digital counting means is controlled on the basis of said counter values (CNT) and wherein the velocity of the transmitter is determined on the basis of the deviation between the first and second frequency.

31. Ranging system according to claim 30, wherein said reference timing means is a clock (101).

32. Ranging system according to claim 30 or 31, wherein additional timing means are provided for driving said second digital counting means (109, 109').

33. Ranging system according to claim 30, wherein said digitally modulated signal is a digital data stream (DS), especially according to a standard like MPEG/DVB.

34. Method for measuring the relative velocity of a transponder in a communication channel, especially between a ground station and a satellite, on the basis of first and second payload signals including counter values (CNT), which are generated by a first digital counting means (102) driven by a reference timing means (101) at a first frequency, transmitted by said transmitter, comprising:

receiving said first payload signal suitable for being transmitted to said transponder,

receiving a transport stream signal transmitted from said transponder and independently from said digitally modulated signal (DS),

wherein both the digitally modulated signal (DS) and the transport stream signal are processed by the following steps:

- demodulating said digitally modulated signal (DS) or said transport stream signal respectively,

- extracting the counter values (CNT) from the received digitally modulated signal (DS), and

- generating second counter values at a second frequency,

wherein the second counter values are controlled on the basis of said counter values (CNT) and wherein the velocity of the transmitter is determined on the basis of the deviation between the first and second frequency.

35. Method according to claim 34, wherein said digitally modulated signal is a digital data stream (DS), especially according to a standard like MPEG/DVB.